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E7.6-10016.1

CR-119124

Interim Report

ORSER-SSEL Technical Report 26-74

APPLICATION OF ERTS IMAGERY TO THE STUDY OF RESIDUAL KAOLINS

R. W. Pollok

(E76-10016) APPLICATION OF ERTS IMAGERY TO  
THE STUDY OF RESIDUAL KAOLINS Interim  
Report (Pennsylvania State Univ.) 3 p HC  
\$3.25

N76-10548

CSCL 08G

Unclass

G3/43 00016

ERTS Investigation 082  
Contract Number NAS 5-23133

INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF ERTS DATA  
WITHIN THE SUSQUEHANNA RIVER BASIN

Resource Inventory, Land Use, and Pollution

Office for Remote Sensing of Earth Resources (ORSER)  
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Date: December 1974

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SEP 18 1975

SIS/902.6

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APPLICATION OF ERTS IMAGERY TO THE STUDY OF RESIDUAL KAOLINS  
R. W. Pollok

In the summer of 1971, a study was begun to determine the origin of the white kaolinitic clays associated with the Gatesburg formation (upper Cambrian) in central Pennsylvania. The approach was to integrate stratigraphy, structure, and geomorphology at the field level with bedrock and clay petrology and petrography, with the hope of establishing an exploration model. Early in the study it became clear that the clays were in fact residual, produced by weathering of feldspathic siltstones in the sandy members of the Gatesburg formation. Clay deposits were mapped which were aligned in directions both parallel and normal to strike. Standard and infra-red aircraft photography was used in selected areas to determine if this distribution was in any way correlated with fracture traces or lineaments. In none of the areas did lineations on the photos correspond to the linear distribution of occurrences.

ERTS imagery was employed to investigate the possibility of correlation of deposit locations with larger linear features, the hypothesis being that the feldspathic horizons are weathered to kaolinite only where percolation has been enhanced by fracture. Twenty-two (22) occurrences of clay were mapped on 7 1/2 minute quadrangles from Bedford to Lamar and the lineaments transferred from the September 6, 1972 (1045-15243) and the March 23, 1973 (1243-15253) ERTS imagery to these maps by means of the Saltzman projector. Of these 22 deposits, only two had lineaments transecting them. In terms of mineralogy, petrography, and distribution of the various clay types, these deposits did not differ from the remaining twenty. At one clay location not transected by linear features, a significant amount of kaolinite had altered to gibbsite, indicating local conditions of severe leaching. If lineaments or fracture traces have any influence on clay genesis in the region, photos and imagery should have revealed them at this locality. It is concluded from the integrated study of this deposit and others, that factors such as bed attitudes, initial rock porosity, and local topography were more influential in enhancing percolation than was the fracturing, now manifest as fracture traces and lineaments.

Although modular and banded goethites are sometimes intimately associated with these clays and are believed also to be a product of weathering, the scope of the present study would not permit correlation of lineations with the iron ore occurrences. It is suggested that these associations be investigated in the future, however, to determine whether or not the ores are gossans on sulfides emplaced along fractures.

ABSTRACT

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ERTS imagery was employed to investigate the possibility of correlation of clay deposits in the Gatesburg formation of central Pennsylvania with linear features. Twenty-two clay occurrences were mapped on 7 1/2 minute quadrangle maps from Bedford to Lamar, and lineaments were transferred from two ERTS images (1045-15243 and 1243-15253) to these maps. Only two of the clay occurrences were found on lineaments. In a smaller study, using aircraft photography, it was found that there was no correlation between the occurrence of clay deposits and the location of fracture traces.

It is concluded that factors such as bed attitudes, initial rock porosity, and local topography were more influential in enhancing percolation and concentration of clay deposits than was fracturing manifest as fracture traces and lineaments.